

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT TX1002E

Golden Pass LNG Terminal, Texas

Introduction

Coastal Mapping Program (CMP) Project TX1002E provides highly accurate digital shoreline data for the Golden Pass Liquefied Natural Gas Terminal along the Port Arthur Ship Canal near Sabine Pass in southern Texas. TX1002E is a sub project of TX1002 which covers Sabine Lake, Sabine River, and Neches River, including the ports of Beaumont, Orange, Port Arthur, and Sabine Pass. The Geographic Cell (GC) may be used in support of the NOAA Nautical Charting Program (NCP) as well as geographic information systems (GIS) for coastal zone management applications.

Project Design

Project TX1002E was designed per a request from the Marine Chart Division (MCD) of the Office of Coast Survey, NOAA, for GIS data in support of efforts to chart the newly constructed LNG terminal.

Field Operations

The field operations consisted of the collection of static and kinematic Global Positioning System (GPS) data and Inertial Measurement Unit (IMU) data and the acquisition of aerial imagery. The photographic mission operations were conducted on March 12th 2010 with the NOAA King Air aircraft (N68RF). Two strips of natural color digital images were acquired with an approximate ground sample distance of 0.34 meters through the use of an Applanix Digital Sensor System (DSS-439) DualCam digital camera.

A base station was established at Chennault International Airport in Louisiana using static GPS. Airborne kinematic GPS data was collected in conjunction with an Inertial Measurement Unit (IMU) data to determine precise camera positions and orientations.

GPS Data Reduction

GPS and IMU data were processed by Remote Sensing Division (RSD) personnel to yield precise positions and orientations of camera centers as a means of rendering accurately positioned digital images. The static GPS base station data was processed in May of 2010 using the NGS Online Processing User Service (OPUS) software to compute fixed baseline solutions from three CORS stations. The final NAD83 position reported by OPUS was the average of these three baseline solutions. The airborne kinematic data was processed using Applanix POSPAC (ver. 4.4) software in July 2010.

Aerotriangulation

Routine softcopy aerotriangulation methods were applied to establish a network of precise camera positions and other control for mapping, and to provide model parameters and orientation elements required for digital compilation. This work was initiated by RSD personnel in July 2010 utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components, and other associated peripheral devices. The digital images were measured and adjusted as a single block using BAE Systems SOCET SET (version 5.5.0) photogrammetric suite in conjunction with the Bingo aerotriangulation software. Upon successful completion of the aerotriangulation process, the Bingo software provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.3 meters based on a 95% confidence level. An Aerotriangulation Report was written and is on file with other project data within the RSD Project Archive.

The project database consists of project parameters and options, camera calibration data, interior orientation parameters, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is referenced to the North American Datum of 1983 (NAD83).

Compilation

The data compilation phase of this project was initiated by RSD in July 2010. Digital mapping was performed using a DPW in conjunction with the SOCET SET Feature Extraction software module. Feature identification and attribution within the Geographic Cell (GC) were based on image analysis of the digital photographs and information extracted from the appropriate NOAA nautical charts, U.S. Coast Guard Light List and other ancillary sources. Feature attribution was assigned in compliance with the Coastal Cartographic Object Attribute Source Table (C-COAST), which provides the definition and attribution scheme for the full range of cartographic features pertinent to the CMP. Selected features were further modified with additional descriptive information to refine general classification.

Spatial data accuracies for Project TX1002E were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.6 meters at the 95% confidence level. The predicted accuracy of compiled, well defined points is derived by doubling the circular error computed from aerotriangulation statistics.

The following table provides information on the imagery used to complete this project:

Date	Time (UTC)	Roll Number	Photo Numbers	GSD (nominal)	Tide Level*
3-12-10	18:03	10NC09	2582-2586	0.34 m	0.1
3-12-10	18:14	10NC09	2623-2627	0.34 m	0.1

* Tide levels are given in meters above MLLW and are based on actual observations recorded by the NOS gauge at Sabine Pass North. The elevation of MHW at Sabine Pass North is 0.5 meters above MLLW.

Final Review

The final review of the project was completed by a senior member of RSD in July of 2010, and included analysis of aerotriangulation results and assessment of the identification and attribution of digital feature data within the GC according to image analysis and criteria defined in C-COAST. The quality control process concluded with an inspection of topological connectivity within the GC using ArcGIS 9.3 software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical chart with natural color digital images and compiled project data resulted in the creation of the Chart Evaluation File (CEF).

The following nautical chart was used in the comparison process:

11342, Sabine Pass and Lake, 1:40,000 scale, 53rd edition

End Products and Deliverables

The following specifies the location and identification of the products generated during the completion of this project:

RSD Applications Branch Archive

- Hardcopy of the Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC10847 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC10847 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

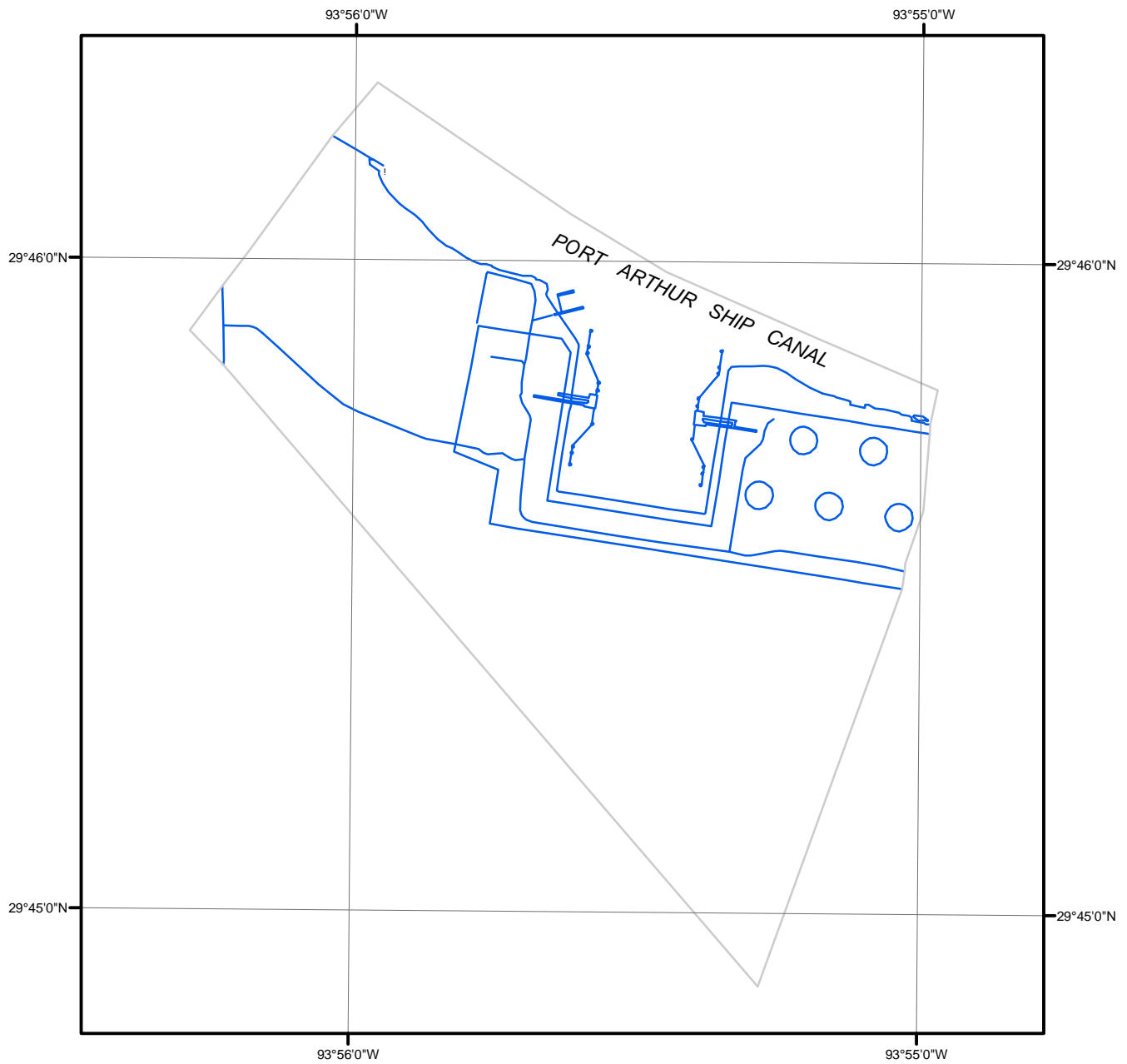
NOAA Shoreline Data Explorer

- GC10847 in shapefile format
- Metadata file for GC10847
- Digital copy of the PCR in Adobe PDF format

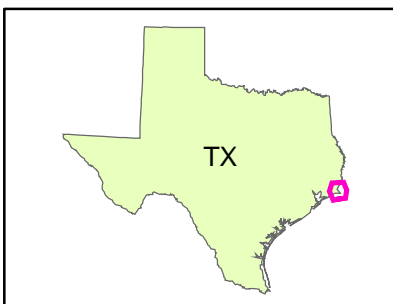
End of Report

GOLDEN PASS LNG TERMINAL

TEXAS



Overview



TX1002E

GC10847